

In the Claims:

Please add the following new claims:

- 24. A glow plasma discharge apparatus for generating and maintaining a glow plasma discharge;
a pair of electrodes positioned at facing relation having a space therebetween;
a perforated dielectric placed over one of the electrodes and partially occupying the space;
and
a time varying electric field generated between the electrodes.

25. The apparatus of claim 24 wherein the time varying electric field is generated by AC current.

26. The apparatus of claim 24 wherein the time varying electric field is generated by pulsed DC current.

27. The apparatus of claim 24 wherein the perforated dielectric comprises a plurality of apertures, each aperture having a diameter ranging from 5 to 200 μ m.

28. The apparatus of claim 27 wherein the dielectric is between 100 μ m and 2mm in thickness.

29. The apparatus of claim 28 wherein the dielectric comprises silicon nitride.

30. The apparatus of claim 28 wherein the dielectric comprises silicon carbide.

31. The apparatus of claim 28 wherein a second dielectric is placed over the other of the electrodes.

32. The apparatus of claim 28 wherein the dielectric is a high temperature dielectric able to withstand high temperatures.

33. A cathode for generating and maintaining a glow plasma discharge at atmospheric pressure comprising;

an electrode;

a time varying electric field applied to the electrodes;

perforated dielectric means placed over the electrode; and

means for retaining the perforated dielectric on the electrodes.

34. The apparatus of claim 33 wherein the time varying electric field is generated by AC current.

35. The apparatus of claim 33 wherein the time varying electric field is generated by pulsed DC current.

36. The apparatus of claim 33 wherein a perforated dielectric means comprises a plurality of apertures, each aperture having a diameter ranging from 5 to 200 μ m.

37. The apparatus of claim 36 wherein the perforated dielectric means is between 100 μ m and 2mm in thickness.

38. The apparatus of claim 37 wherein the perforated dielectric means comprises silicon nitride.

39. The apparatus of claim 37 wherein the perforated dielectric means comprises silicon carbide.

40. The apparatus of claim 38 wherein a second perforated dielectric means is placed over the other of the electrodes.

41. The apparatus of claim 38 wherein the perforated dielectric means is a high temperature dielectric able to withstand high temperatures.

42.

Method of generating and maintaining a glow plasma discharge comprising the steps of:

positioning opposing electrodes in a facing relation with a space therebetween; ✓

providing within the space a perforated dielectric (having a plurality of apertures of micron dimension) and

generating a time varying electric field between the electrodes.

43. The method of claim 42 wherein the time varying electric field is generated by AC current.

44. The method of claim 42 wherein the time varying electric field is generated by pulsed DC current.

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45. The method of claim 42 further comprising the step of providing a second perforated dielectric having a plurality of apertures of micron dimension within the space.

46. The method of claim 42 wherein the step of positioning the perforated dielectric with the space further comprises placing the perforated dielectric on an electrode and retaining the dielectric thereon.

47. The method of claim 46 wherein the step of retaining the dielectric on one of the electrodes further include the step of placing a retaining collar over the dielectric.

48. The method of claim 42 wherein the step of positioning the perforated dielectric within the space comprises the step of depositing a dielectric on one of the electrodes.

49. The method of claim 48 wherein the step of depositing a dielectric on one of the electrodes comprises vapor deposition.

50. A method of stabilizing glow-to-arc transition for a discharge plasma comprising the steps of:

positioning electrodes in facing relation;

positioning a dielectric (having a plurality of current limiting micro-channel apertures therethrough for limiting current density from increasing above glow-to-arc transition) between the electrodes; and

applying a time varying electric field between the electrodes.

51. The method of claim 50 wherein the time varying electric field is generated by AC current.

52. The method of claim 50 wherein the time varying electric field is generated by pulsed DC current.
53. The method of claim 50 further comprising the step of covering the other of the electrodes with a perforated dielectric having a plurality of current limiting micro-channel apertures so that both electrodes are covered.
54. The method of claim 50 wherein the step of covering one of the electrodes comprises placing a dielectric material thereon and retaining the dielectric material thereon.
55. The method of claim 54 wherein the state of retaining the dielectric material on one of the electrodes further includes the step of securing a retaining collar having an upper surface with a cylindrical aperture extending therethrough, and sidewalls depending therefrom, over the dielectric.
56. The method of claim 50 wherein the step of covering one of the electrodes comprises the step of depositing a dielectric on one of the electrodes.
57. The method of claim 56 wherein the step of depositing a dielectric on one of the electrodes comprises vapor deposition.

58. A method of generating and maintaining a glow plasma discharge at atmospheric pressure comprising the steps of:

positioning opposing electrodes in a facing relation with a space therebetween;

providing within the space a perforated dielectric (having a plurality of apertures of micron dimension); and

generating an electric field between electrodes.

59. The method of claim 58 further comprising the step of providing a second perforated dielectric having a plurality of apertures of micron dimension within the space.

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60. The method of claim 58 wherein the step of positioning the perforated dielectric within the space comprises the step of depositing on one of the electrodes.

61. The method of claim 60 wherein the step of depositing a dielectric on one of the electrodes comprises vapor deposition.--

Please cancel claims 1-23.